

On page 43, line 17, delete "snapshot 2 and for blkmap file 2344." and insert --blkmap file 2344 and snapshot 2. Buffer 2308 is already marked with an asterisk because inodes 2308A and 2308B are dirty in Figure 21A.-- in place thereof.

On page 43, line 19, insert --as illustrated in Figure 21B, where block 2326 is marked with an asterisk-- after "dirtied".

On page 44, line 9, insert --, as indicated in Figure 21F-- after "disk".

On page 44, line 31, insert --be-- after "to".

On page 45, lines 21-22, delete "2433 of snapshot 2432 that references it" and insert --at which direct block 2410 was accessed-- in place thereof.

IN THE DRAWINGS

Please amend Figures 17G, 21B, and 23B as shown in the accompanying drawing sheets, in which the proposed amendments are indicated in red ink.

IN THE CLAIMS

Please amend pending claims 1 and 2 as follows.

1. (Once amended) A method for [generating a] maintaining a file system stored in non-volatile storage means at successive consistency [point] points, said file system comprising blocks of data, said blocks of data comprising blocks of regular file data and blocks of meta-data file data referencing said blocks of data of said file system, said meta file data comprising a file system information structure comprising data describing said file system at a first consistency point, said computer system further comprising memory means, said method comprising the steps of:
maintaining a plurality of modified blocks of regular file data and meta-data file data in said memory means, said modified blocks of data comprising blocks of data modified from said first consistency point;

[marking a plurality of inodes pointing to a plurality of] designating as dirty blocks of meta-data file data referencing said modified blocks of regular file data and meta-data file data [in a file system as being in a consistency point], said dirty blocks of meta-data file data comprising blocks of meta-data file data to be included in a second consistency point;

[flushing] copying said modified blocks of regular [files] file data referenced by said dirty blocks of meta-data file data to free blocks of said non-volatile storage means;

[flushing special files] copying blocks comprising said modified blocks of meta-data file data referenced by said dirty blocks of meta-data file data to free blocks of said non-volatile storage means;

modifying a copy of said file system information structure maintained in said memory means to reference said dirty blocks of meta-data file data;

[flushing at least one block of] copying said modified file system information structure to said non-volatile storage means; and,

requeueing any dirty inodes that were not part of said consistency point].

2. (Once amended) The method of claim 1 wherein said blocks of meta-file data comprise one or more blocks of inode file data and one or more blocks of blockmap file data and wherein said step of [flushing] copying said [special files] modified blocks of meta-data file data to free blocks of said non-volatile storage means further comprises the steps of:

[pre-flushing] copying an inode [for a] referencing one or more blocks of blockmap file data to a block of [an] inode file data maintained in said memory means;

allocating [space on] free blocks of said non-volatile storage means for [all dirty blocks in] said block of inode file data and one or more modified blocks of blockmap [files] file data;

updating said inode referencing said one or more blocks of blockmap file data to reference said one or more free blocks of said non-volatile storage means allocated to said one or more modified blocks of blockmap file data;

[flushing] copying said updated inode [for said blockmap file again] to said block of inode file data;

updating [a plurality of entries in] said one or more blocks of blockmap file data [wherein each entry of said plurality of entries represents a block on said storage means; and,];

writing [all dirty blocks in said] said updated one or more blocks of blockmap file data and said block of inode file data to said allocated free blocks of said non-volatile storage means.

Please add the following new claims 3-21:

—3. A method for maintaining a file system comprising blocks of data stored in blocks of a non-volatile storage means at successive consistency points comprising the steps of:

storing a first file system information structure for a first consistency point in said non-volatile storage means, said first file system information structure comprising data describing a layout of said file system at said first consistency point of said file system;

writing blocks of data of said file system that have been modified from said first consistency point as of the commencement of a second consistency point to free blocks of said non-volatile storage means;

storing in said non-volatile storage means a second file system information structure for said second consistency point, said second file system information structure comprising data describing a layout said file system at said second consistency point of said file system.--

--4. The method of claim 3 wherein said step of storing said first file system information structure in said non-volatile storage means comprises the step of:

storing first and second copies of said first file system information structure at first and second locations respectively of said non-volatile storage means;

and wherein said step of storing said second file system information structure in said non-volatile storage means comprises the steps of:

overwriting said first copy of said first file system information structure with a first copy of said second file system information structure; and

overwriting said second copy of said first file system information structure with a second copy of said second file system information structure.--

--5. The method of claim 4 wherein said first and second locations of said non-volatile storage means comprise fixed predetermined locations of said non-volatile storage means.--

--6. The method of claim 4 wherein each copy of said file system information structure comprises means for determining a most recent version of said file system information structure and means for determining validity of said file system information structure, further comprising the steps of:

after a system failure, reading said first and second copies of said file system information structure from said first and second locations of said non-volatile storage means;

determining a most recent valid file system information structure from said first and second copies of said file system information structure.--

-7. A method for creating a plurality of read-only copies of a file system stored in blocks of a non-volatile storage means, said file system comprising meta-data identifying blocks of said non-volatile storage means used by said file system, comprising the steps of:

storing meta-data for successive states of said file system in said non-volatile storage means;

making a copy of said meta-data at each of a plurality of said states of said file system;

for each of said copies of said meta-data at a respective state of said file system, marking said blocks of said non-volatile storage means identified in said meta-data as comprising a respective read-only copy of said file system.--

--8. The method of claim 7 wherein said step of marking said blocks comprising a respective read-only copy of said file system comprises placing an appropriate entry in a means for recording multiple usage bits per block of said non-volatile storage means.--

--9. The method of claim 8 wherein said means for recording multiple usage bits per block of said non-volatile storage means comprises a blockmap comprising multiple bit entries for each block.--

--10. The method of claim 7 wherein said meta-data comprises pointers to a hierarchical tree of blocks comprising said file system.--

--11. The method of claim 7 wherein said meta-data comprises structures representing files of said file system.--

--12. The method of claim 11 wherein said structures representing files of said file system comprise inodes.--

--13. The method of claim 7 further comprising the step of:

preventing overwriting of said blocks marked as belonging to a read-only copy of said file system.--

--14. The method of claim 7 comprising the step of unmarking said blocks marked as belonging to a read only copy of said file system when said read only copy of said file system is no longer needed.--

--15. The method of claim 7 wherein a plurality of said blocks marked as belonging to a read-only copy of said file system comprise data ancillary to said file system, said method further including the steps of:

allowing said ancillary data to be overwritten; and

otherwise preventing overwriting of said blocks marked as comprising a read only copy of said file system.--

--16. The method of claim 15 wherein said ancillary data comprises access time data.--

--17. The method of claim 7 wherein said meta-data comprises a root structure referencing structures representing files of said file system, and wherein said copies of said meta-data comprise copies of said root structure.

--18. The method of claim 17 wherein said root structure comprises a root inode.--

--19. The method of claim 7 further comprising the step of using one or more of said read-only copies of said file system to back-up said blocks comprising one or more consistency points of said file system.--

--20. A method for recording a plurality of data about a plurality of blocks of data stored in storage means comprising the steps of: